Chapter 4

System Module

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Baseband Block Connections

Below is a list of the functional blocks of the baseband architecture:

- Power Supply Charging Logic Device (PSL+3)
- Microcomputer Unit (MCU)
- MCU External Memory –
  Electrically Eraseable Programmable Read Only Memory (EEPROM)
  Static Random Access Memory (SRAM)
  Flash Memory
- Digital Signal Processor (DSP)
- DSP External Memory –
  Static Random Access Memory (SRAM)
- CDSB ASIC
- CDMA RF to BB Interface (CDRFI)
- Audio Coder/Decoder (CODEC)

Internal Signals and Connections

Power Block

Table 1. Power Block Connections

Signal Name	Type	Notes
XPWRON	IN	PWR on switch
XPWROFF	IN	Power off control
VBATT	IN	Battery voltage
VCHAR	IN	Charging voltage
VOLTLIM	IN	Voltage Limiting of charging while call is in progress.
5VOFF	IN	voltage reg control –ON / OFF
VCHRGPWM	IN	PWM for controlling battery charging.
XPWR_RESET	OUT	Master reset
VL1	OUT	Logic supply voltage 1.
VL2	OUT	Logic supply voltage 2.
VL3	OUT	Logic supply voltage 3.
VA1	OUT	Analog supply voltage 1.
VA2	OUT	Analog supply voltage 2.
VREF	OUT	Reference voltage
VL5VOLT	OUT	Logic supply voltage for MBUS

Table 1. Power Block Connections (continued)

Signal Name	Type	Notes
VLCD	OUT	Voltage for LCD on UIF
VBATDET	OUT	Switched VBATT
VC	OUT	Attenuated VCHRGMON
CHRG_INT	OUT	Signal to indicate a Charger has been connected to Phone.

MCU Block

Table 2. MCU Block Connections

Signal Name	Type	Notes
MCU_CLK	IN	Clk into MCU
XSYS_RESET	IN	MCU Reset
MCUAD(19:0)	OUT	MCU Address Bus
MCUDA(7:0)	I/O	MCU Data Bus
XMCU_AS	OUT	MCU Address Strobe
XMCU_RD	OUT	MCU Read
XMCU_WR	OUT	MCU Write
MCU_NMI	IN	MCU Non Maskable Interupt
MCU_INT0	IN	MCU Maskable Interupt 1
CODEC_DI	OUT	Audio codec control data
CODEC_CLK	OUT	Codec Clock
XCODEC_CS	OUT	Audio codec chip select
CODEC_DO	IN	Audio codec control data
CALL_LED	OUT	UIF CALL_LED enable
BACK_LIGHT	OUT	UIF BACK_LIGHT enable
PHFS_TXD2	OUT	Hands Free speaker Mute Control
HOOK_RXD2	OUT	Hook Recieved data
VIB_CONT	OUT	Vibrator Control
MBUS_OUT	OUT	MBUS data output
VAHS_EN	OUT	Headset voltage enable
VOLTLIM	OUT	Voltage Limiting
5VOFF	OUT	voltage reg control
VCHRGPWM	OUT	Control PWM
XPWROFF	OUT	Watchdog signal
TEMP1_EN	OUT	RFTEMP1
TEMP2_EN	OUT	RFTEMP2
VBATDET	IN	A/D input for battery voltage level

Table 2. MCU Block Connections (continued)

Signal Name	Type	Notes
VCHRGMON	IN	A/D input for monitoring of charging voltage
HOOK_RXD2	IN	A/D input – Hook indicator (Phone on or off Hook)
BTEMP	IN	A/D input for monitoring Battery temp.
RFTEMP	IN	A/D input for monitoring RFTEMP 1 and 2 temp.
BTYPE	IN	A/D input for monitoring Battery type.
RSSI	IN	A/D input for monitoring RSSI.
JCONN	IN	A/D input for monitoring Accessory type.
MBUS_DET	IN	MBUS data input.

MCU Memory Block

Table 3. MCU Memory Block Connections

Signal Name	Type	Notes
MCUAD	IN	MCU Address Bus
MCUDA	I/O	MCU Data Bus
XMCU_RD	IN	MCU Read used as Output Enable
XMCU_WR	IN	MCU Write used as Read/Write select
XFLASH_CS	IN	Flash Chip Select
XSRAM_CS	IN	SRAM Chip Select
XROM_CS	IN	EEPROM Chip Select

DSP Block

Table 4. DSP Block Connections

Signal Name	Type	Notes
DSP_CLK	IN	DSP Clock
XSYS_RESET	IN	DSP Reset
DSP_INT0	IN	DSP Maskable Interupt 0
DSP_INT1	IN	DSP Maskable Interupt 1
DSPAD(15:0)	OUT	DSP Address Bus
DSPDA(15:0)	I/O	DSP Data Bus
DSP_RXW	OUT	DSP Read / Write Select
XDSP_STRB	OUT	DSP Master Strobe for Memory Access
XDSP_DS	OUT	DSP Data Strobe for Memory Access
Codec_FS	IN	Frame Sync
Codec_MCLK	IN	Codec CLK
PCMOUT	IN	Data from Codec
PCMIN	OUT	Data to Codec
DSP_SYNC	I/O	Frame Sync
DSP_MCLK	I/O	CLK
DBUS_IN	IN	Data to DSP.
DBUS_OUT	OUT	Data from DSP.

DSP memory Block

Table 5. DSP Memory Block Connections

Signal Name	Type	Notes
DSPAD(15:0)	IN	DSP Address Bus
DSPDA(15:0)	I/O	DSP Data Bus
DSP_RXW	IN	DSP Read / Write Select
XDSP_STRB	IN	DSP Master Strobe

CDSB ASIC Block

Table 6. CDSB ASIC Block Connections

Signal Name	Type	Notes
XPWR_ RESET	IN	Master reset FROM PSL+ 3
XSYS_RESET	OUT	System Reset
OSC_OUT	IN	32KHz Clk input
OSC_IN	IN	32KHz Clk input
CDRFI_SI	OUT	CDRFI Serial Data In
CDRFI_SO	IN	CDRFI Serial Data Out
CDRFI_SEN	OUT	CDRFI Serial data ENABLE
CDRFI_SCLK	OUT	CDRFI Serial data CLocK
CDRFI_9.8M	OUT	CDRFI 9.8 MHz clock
15.36M_IN	IN	15.36MHz Clk IN
9.83M_IN	IN	9.83MHz Clk IN
TXD(7:0)	I/O	CDRFI TX Data
CDRFI_RWSEL	OUT	CDRFI Read/Write SELect
CDRFI_IQSEL	OUT	CDRFI Tx IQ SELECT
RXQ	IN	CDRFI RX Quadrature–phase data
RXI	IN	CDRFI RX In–phase data
DAFOUT	IN	CDRFI DAF INput
GATE	OUT	CDRFI
VCO_EN	OUT	CDRFI
DSP_CLK	OUT	7.68 MHz Clk to DSP
DSP_INT0	OUT	DSP Maskable Interupt 0
DSP_INT1	OUT	DSP Maskable Interupt 1
DSPAD	IN	DSP Address Bus
DSPDA	I/O	DSP Data Bus
DSP_RXW	IN	DSP Read / Write Select
XDSP_STRB	IN	DSP Master Strobe
XDSP_DS	IN	DSP Data Strobe
DSP_SYNC	OUT	Frame Sync
DSP_MCLK	OUT	CLK
Codec_FS	OUT	Frame Sync
Codec_MCLK	OUT	CLK
MCU_CLK	OUT	15.36 MHz Clk to MCU
MCUAD(19:0)	IN	MCU Address Bus

Table 6. CDSB ASIC Block Connections (continued)

Signal Name	Type	Notes
MCUDA	I/O	MCU Data Bus
XMCU_AS	IN	MCU Address Strobe
XMCU_RD	IN	MCU Read Enable
XMCU_WR	IN	MCU Write used as Read/Write select
MCU_NMI	OUT	MCU Non Maskable Interupt
MCU_INT0	OUT	MCU Maskable Interupt 1
MBUS_DET	IN	MBUS data input.
CHRG_INT	IN	Signal to indicate a Charger has been connected to Phone.
XFLASH_CS	OUT	Flash Chip Select
XSRAM_CS	OUT	SRAM Chip Select
XROM_CS	OUT	EEPROM Chip Select
LCD_COL	I/O	LCD and COL/RO lines to UIF
CDATTEN	OUT	SW AGC to RF
RF_LIMADJ	IN	
RF_SCLK	OUT	Serial Data Clk
RF_SDATA	OUT	Serial Data
RF_RX_LE	OUT	Latch Enable for Serial Data
RF_TXB	OUT	Tx Power Bias
RF_TXREF	OUT	REF Level for TXIP comparator
RF_AFC	OUT	VCTCXO control voltage
RF_AGCREF	OUT	Sets RXI & RXQ levels
RF_TXGAIN	OUT	Offsets TX gain to RX gain
RF_TXSLP	OUT	Correction of TX gain slope
RF_RXSLP	OUT	Correction of RX gain slope
RF_TXC	OUT	Limit maximum TX gain
RF_TXPUNC	OUT	
RF_VCO_EN	OUT	
RF_RFE0	OUT	RFEN0
RF_RFE1	OUT	RFEN1
RF_RFE2	OUT	RFEN2
RF_RFE3	OUT	FAST
RF_RFE4	OUT	RX_FIL_CAL
RF_RFE5	OUT	SEL0

Table 6. CDSB ASIC Block Connections (continued)

Signal Name	Type	Notes
RF_RFE6	OUT	SEL1
RF_RFE7	OUT	RF Control Line

CDRFI Block

Table 7. CDRFI Block Connections

Signal Name	Type	Notes
XSYS_RESET	IN	XRESET
SDI	IN	Serial Data In
SDO	OUT	Serial Data Out
SENABLE	IN	Serial data ENABLE
SCLK	IN	Serial data CLocK
9.8M	IN	9.8 MHz clock
VCLKIN	IN	VCLocK INput
VCLKOUT	OUT	VCLocK OUTput
CLKIN	IN	CLocK INput
CLKOUT	OUT	CLocK OUTput
TXI+	OUT	TX signal In–phase (+)
TXI–	OUT	TX signal In–phase (–)
TXQ+	OUT	TX signal Quadrature–phase (+)
TXQ–	OUT	TX signal Quadrature–phase (–)
TXD(7:0)	I/O	TX Data
R/WSEL	IN	Read/Write SELect
IQSELECT	IN	Tx IQ SELECT
RXQ	IN	RX signal Quadrature–phase
RXI	IN	RX signal In–phase
RXQ(5:0)	OUT	RX Quadrature–phase data
RXI(5:0)	OUT	RX In–phase data
TXAGC1	OUT	TX AGC control
RXAGC1	OUT	RX AGC control
ANATX	OUT	ANAlog mode TX signal
ANARX+DAF	IN	ANAlog mode RX + DAF signal
DAFOUT	OUT	DAF OUTput
GATE	IN	TBA
VCO_EN	IN	TBA

AUDIO Block

Table 8. Audio Block Connections

Signal Name	Type	Notes
VA2	IN	Analog supply voltage 1. Max 80 mA.
PCMIN	IN	Received audio in PCM–format
CODEC_FS	IN	frame sync
CODEC_MCLK	IN	codec main clock
CODEC_DIN	IN	Audio codec control data
CODEC_CLK	IN	Clock for audio codec control data transfer
XCODEC_CS	IN	Audio codec chip select
HFMIC	IN	External microphone
MICN, MICP	IN	Differential microphone signal
PCMOUT	OUT	Transmitted audio in PCM–format
CODEC_DO	OUT	Audio codec control data
MIC_EN	OUT	Microphone enable
EXTEAR	OUT	External received audio
EARN, EARP	OUT	Internal received audio

External Signals and Connections

Table 9. List of Connectors

Connector Name	Notes
User Interface Connector	30 pin ZIF for Flex
System Connector	Acc., Charging, Test connector.

User Interface Connector

Table 10. UIF Connector

Signal Name	Pin / Conn.	Notes
VL1	1	Logic supply voltage
GND	2, 29	Ground
VBAT	3, 30	Battery voltage
BACKLIGHT	4	Backlights on/off
UIF(0:6)	5 – 11	Lines for keyboard write and LCD–controller control
MIC_EN	12	Microphone bias enable
COL(0:3)	13 – 16	Lines for keyboard read
CALL_LED	17	Call led enable
MICP	18	Microphone (positive node)

Table 10. UIF Connector (continued)

Signal Name	Pin / Conn.	Notes
MICN	19	Microphone (negative node)
EARN	20	Earpiece (negative node)
EARP	21	Earpiece (positive node)
BUZZER	22	Buzzer control
ONKEYX	23	Power key
VA1	24	Analog supply voltage
VL5VOLT	26	LCD supply voltage
NC	25,27,28	NO CONNECT

Baseband Functional Description

Below is a list of the functional blocks of the baseband architecture:

- Power Supply
- Microcomputer Unit (MCU)
  - External Memory –
    - Electrically Eraseable Programmable Read Only Memory (EEPROM)
    - Static Random Access Memory (SRAM)
    - Flash Memory
  - MBUS
- Digital Signal Processor (DSP)
  - External Memory –Static Random Access Memory (SRAM)
  - DBUS
  - Multipath Analyzyer
- Audio Coder/Decoder (CODEC)
- CDSB ASIC
  - Sleep Clock Oscillator (32 KHz)
- CDMA RF to BB Interface (CDRFI)
- RF Interface

Power Supply

The PSL+3 – IC produces the supply voltages:

3 * VL	150 mA for logic
VA1	40 mA not used at this time
VA2	80 mA for AUDIO
VREF	5 mA reference

It also has internal watchdog, voltage detection and charger detection functions. The watchdog will cut the output voltages if it is not resetted once in about 6 seconds. The voltage detector resets the phone if the battery voltage falls below 4.0 V. The charger detection starts the phone if it is in power–off when the charging voltage is applied.

The charging electronics is controlled by the MCU. When the charging voltage is applied to the phone while the phone is powered up, the MCU detects it and starts controlling the charging.

If the phone is in power–off, the PSL+3 will detect the charging voltage and start the phone. If the battery voltage is high enough the reset will be released and the MCU will start controlling the charging. If the battery voltage is too low the phone is in reset and charging control circuitry will pass the charging current to the battery. When the battery voltage has reached 4 V the reset will be removed and the MCU starts controlling the charging. This all is invisible to the user.

MCU Block

The MCU block controls the user interface, link layer, upper layer protocols, some physical layer tasks, and accessories not linked to data services. It also executes service and diagnostics commands and manages the battery.

DSP Block

The DSPU provides control and signal processing for AMPS and CDMA modes of operation.

– Control and general functions:
  – communication with MCU / PC–Locals
  – mode control of ASIC hardware
  – RF control
  – DBUS communication
– AMPS mode speech processing:
  – audio signal filtering
  – acoustic echo cancellation
– AMPS mode modem functions:
  – ST (Signalling Tone) signal generation
  – SAT (Supervisory Audio Tone) signal detection and regeneration
  – WBD (Wide Band Data) sending
  – Handoff control
– CDMA mode speech processing:
  – Vocoder (Voice Coder) encoding and decoding
  – acoustic echo cancellation
– CDMA mode control:
  – PN (Pseudo Noise) signal acquisition and monitoring
  – soft & hard handoffs
  – ASIC Rake Receiver demodulator control
  – received data rate determination
  – Multiplex Sublayer (LM) routing of data to MCU or Voice Coder
  – Loopback and Markov Service Options

CDRFI

CDRFI is a monolitic CMOS high speed CODEC designed for use in CDMA (Code Division Multiple Access) Digital Cellular Telephone applications. It provides AD conversion of the in–phase and quadrature signals in receive path and generation of the in–phase and quadrature signals in transmit path. The CODEC interfaces with digital chip(s) via two parallel interface (separate interfaces for AD and DA signal converters) and one serial interface (for the control DA converters).

Audio Block

The block consists of audio codec with some peripheral components. The codec includes microphone and earpiece amplifier and all the necessary switches for routing. The controlling of the codec is done by the MCU. The PCM–data comes from and goes to DSPs.

The code converts analog voice to digital samples that can be processed by the DSP. It also accepts DSP processed speech, converts it to analog and transmits the output to the handset or hands free speaker. The codec communicates linear coded data with the DSP over a dedicated serial port. The master clock of the codec is synchronized with the RF VCTCXO and generated by the CDSB ASIC. Codec set up and DTMF tone generation are controlled by the microprocessor via a second serial port.

Transmitter Functional Description

The transmitter stages are as follows:

- The CDAGCT ASIC
- The Variable Attenuator
- Two SAW filters
- Three BJT driver amplifiers
- The GaAs FET power amplifier
- The Detector circuit
- The Isolator
- The Duplexer

Introduction

NHD–4 uses the same transmitter to up convert, amplify and filter the analog AMPS and the digital CDMA signals. The key differences between analog and digital transmission are the Power Amplifier (PA) bias levels , attenuation levels of the variable attenuator, and operation of the RF transmitter ASIC (CDAGCT). It is important to keep in mind that the AMPS and CDMA signals are significantly different. The AMPS signal is distinct FM modulated carrier with a channel bandwidth of 30 kHz. CDMA modulation is spread spectrum. A CDMA signal is 1.23 MHz wide and appears noise–like.

Aside from this introduction, the Functional Description describes the various signals entering and exiting the NHD–4 transmitter circuit, as well as the DC voltage supplies that bias it.

TX Gain Limiting

TX Limiting is a control feature for CDMA TX operation. In some conditions the AGC loop of the phone may call upon the transmitter to provide more output power than is recommended for healthy operation. The TX Limiting circuit places a ceiling or limit on the output power of the CDMA transmitter. Transmitting above the limit might put the CLY–10 PA (V113) out of its linear range of operation.

In CDMA operation the TXI_REF PDM stays fixed at a tuned voltage level. This tuned level corresponds to the TX output power limit. The tuned TXI_REF PDM line will be approximately 1.0 V. The detector voltage, TXI, directly reflects the output power of the TX PA chain (V110–V113). For maximum CDMA output power TXI is approximately 1.0 V DC at Pin 2. For minimum CDMA output power TXI is about 2.26 V.

When TXI equals TXI_REF, the LIM_ADJ line goes logic low to approximately 0.0 V. A way to test CDMA TX Limiting Control is to probe the LIM_ADJ line with an oscilloscope and maximize the gain of the transmitter. When the TX output power reaches the limit the LIM_ADJ line will toggle continuously, appearing as a square wave 3.2 Vpp (read at R840) with an approximate frequency of 400 Hz.

CDMA TX Gain Control

A fundamental requirement for proper CDMA system operation is that received signal power levels reaching the digital demodulators remain constant. This is true for both the mobile unit and the base station. The mobile unit must dynamically adjust the gain of its receiver to ensure that the down converted baseband I & Q signal levels delivered to the CDSB ASIC are always constant. The mobile must also dynamically adjust its transmit output power so that the base station always receives the same signal strength. The amount of gain needed at the mobile unit receiver is used to determine how much gain to provide the mobile unit transmitter, thus they are linked in a loop.

The gain of the CDMA transmitter is controlled by two devices, the CDAGCT IC (N100) and the AT–109 variable attenuator (V106).

The TX_OFFSET voltage will fall somewhere between 0.0 and 3.15 V, read at C703. This circuit can be found on the CDCONT schematic. The resultant voltage is found at the CDCONT IC (N201) at pin 7. The CDCONT IC interprets this voltage and generates the TX_ICT and TX_IREF currents.

The gain of the CDAGCT IC (N100) is controlled by the two incoming currents TX_ICT and TX_IREF. These two signals are currents entering the IC at pins 24 and 25, through R116 and R115 respectively. The gain of the IC is set by the ratio of these two current levels. TX_IREF is the reference current. It stays constant at about 1.0 mA. TX_ICT is the control current. It varies in as a function of the TX_Gain voltage at the CDCONT IC.

To measure these currents directly requires that you break the circuit and input an ammeter. This is impractical in a diagnostics environment. Instead it is suggested that you simply measure the voltage drop across R115 and R116 to determine if these signals are correct. The voltage drop across R115 will remain constant at approximately 100 mV, while the drop across R116 will vary from approximately 0.0 mV to 100 mV, depending upon the level of gain required by the AGC system. Below is a table depicting some sample TX_GAIN and TX_ICT values corresponding to CDMA TX output power levels.

CDMA TX Output RF Signal Level (dBm)	TX_GAIN Voltage at C213 (V)	TX_ICT Control Current (mA)	TX_ICT (as voltage drop across R116) (mV)
23	1.72	0.860	86.0
15	1.78	0.700	70.0
10	1.80	0.560	56.0
–5	1.87	0.298	29.8
–20	1.93	0.171	17.1
–35	2.00	0.093	9.3

The Service Software provides a manual control mechanism which provides the ability to test this transmitter control functionality. This mechanism is called CDMA TX Manual Gain Control and is discussed in the Troubleshooting section of this manual.

The amount of attenuation provided by the AT–109 (V106) is controlled by the control voltage VC. VC is a function of the AGC_REF PDM via the circuit centered around the op–amp N202. The N202 op–amp can be found on the CDCONT schematic. VNEG is used at the inverting input of N202. VNEG will remain constant, typically at –4.1 V. For minimum attenuation the AUX AGC PDM voltage is typically 0.75 V, resulting in 3.25 V for VC. For maximum attenuation the AUX AGC PDM voltage is typically 10.0 mV, resulting in 1.50 V for VC.

The auxiliary AGC can be manually adjusted using the AGC_REF PDM controls found in the Service Software. Below is a table detailing typical voltages of the AGC_REF PDM and VC, referenced against CDMA TX output power.

CDMA TX Output Power (dBm)	AGC_REF PDM (decimal value)	AGC_REF PDM voltage at C716 (V)	VC at C109 (V)
23	0	0.798	3.28
21	34	0.583	2.81
19	60	0.456	2.53
17	79	0.367	2.33
15	85	0.333	2.26

The AT–109 is put in its minimum attenuation state for AMPS operation. During AMPS TX operation the AT–109 control voltage VC will be at its maximum, 4.35 V, measured at C214. The AGC_REF PDM will be 1.50 V measured at R222.

AMPS TX Gain Control

NOTE! Be cautious not to confuse the TXI_REF PDM voltage with the TX_IREF control current. The names are quite similar, but indeed they are two different signals.

The TXI_REF PDM has 6 tuned values corresponding to the 6 AMPS power levels used in mobile operation (2–7). The following is a table of typical values of TXI_REF PDM and TXI voltages, and TX_ICT currents for the 6 AMPS power levels. There will be variations from phone to phone.

AMPS Power Level	TXI_REF PDM Voltage (at R210) (V)	TXI_REF PDM decimal value	TXI Detector Voltage (at N202, Pin1) (V)	TX_ICT (voltage drop across R116) (mV)
2	1.05	14	1.05	44.2
3	1.56	239	1.56	38.6
4	1.92	187	1.92	30.5
5	2.10	168	2.10	22.3
6	2.20	157	2.20	21.9
7	2.26	152	2.26	17.9

While the phone is in AMPS TX mode the TX_IREF current will remain constant at approximately 1.0 mA. This current can be read indirectly by measuring the voltage drop across R115. This drop will be approximately 100 mV.

TX PA Bias Control (Dynamic TXB)

The TXB PDM is used to tune the PA bias current. This PDM voltage interacts with, VTXS, VNEG and an op–amp internal to the CDCONT IC (N201) to produce VGG. VGG is the negative voltage supply to the gate of the CLY–10 PA (V113). As VGG changes, so does the bias current., and thus the gain. For minimum bias, the 100 mA case the TXB PDM voltage will be approximately 1.50 V, and VGG will be about –2.35 V. For maximum bias, or the 250 mA case, the TXB bias will be approximately 1.40 V and VGG will be about –2.00 V. A chart better depicts this data. Below are some typical voltages and PDM values for this scenario.

Bias Case	CDMA TX Output Power (dBm)	TXB PDB at C703 (V)	TXB PDM (decimal value)	VGG at C202 (V)
Minimum – 100 mA	<= 10	1.19	228	–2.35
Maximum – 250 mA	>= 23	1.11	239	–2.00

***Note**: Dynamic TXB is only used in CDMA TX modes. For AMPS operation CLY–10 PA (V113) bias is to draw 100 mA at low output powers. The output power of the AMPS transmitter increases, the CLY–10 self–biases from the input signal at the gate, thus increasing the current draw to as much as 320 mA.*

The negative voltage generator N200 generates the VNEG voltage. VNEG comes up when VTXS is active. Both VTXS and VNEG maintain constant voltage levels while on, 4.45 V and –4.10 V respectively. The node at R203, R204 and R205 will remain fixed at 2.0 V during the operation of this circuit. This node is an input to the internal op–amp, which is pin 53 of the CDCONT IC (N201). The base voltage of V201 tracks the VGG voltage.

Temperature Compensation

A thermister (R141) is mounted closely to the final PA stage CLY–10 (V113). The thermister measures the temperature of the power amplifier and sends the information to the microprocessor via the RFTEMP1 line.

Circuit Description

CDAGCT IC (N100)

The CDMA Automatic Gain Control Transmitter ASIC, or CDAGCT (N100) generates the AMPS & CDMA RF signals.

The CDAGCT receives the CDMA baseband I & Q signals from the CDRFI. These two signals exist upon differential lines, TX_I_N/TX_I_P, and TX_Q_N/TX_Q_P entering the CDAGCT IC at pins 16, 15 and 13, 12 respectively. These signals can be probed with an oscilloscope at any of the bypass capacitors in series with these four lines. The level will be approximately 500 mVpp.

Bias voltage to the CDAGCT IC is critical. The bias voltage at pins 6, 14, 17, 20, 21, 26, and 29 should always be approximately 3.9 to 4.0 V. Should it drop to low, or become to great, the CDAGCT IC will not operate properly. A loss of gain may also occur. The VTXT regulator supplies voltage to the CDAGCT IC. VTXT should stay constant at 5.3 V in both AMPS and CDMA operation. The R103, R104 resistor network together with V115 keep the bias to the CDAGCT IC fixed at about 3.9 V.

AT–109 Variable Attenuator (V106)

The AT–109 (V106) is an attenuation stage in the RF path immediately following the CDAGCT IC (N100). The VC voltage to pin 5 of this device sets the level of attenuation. For minimum attenuation in CDMA mode (maximum output power) VC will be 3.25 V. For maximum attenuation in CDMA mode VC is 1.50 V. In AMPS TX mode VC will be approximately 4.35 V throughout the entire dynamic range of the transmitter output. VTXS biases the AT–109 at pin 4. It should be 4.4 V for both AMPS and CDMA operation.

SAW Filter (Z100)

This Surface Acoustic Wave (SAW) filter provides rejection in the RX band (869 to 894 MHz).

1st and 2nd Gain Stages (V110, V111)

The first gain stage V111 should be biased with approximately 3.85 V on the collector and 0.73 V on the base. V100 acts as a switch, sourcing current to V111 when the bias voltage on the emitter resistor goes high to approximately 4.7 V. V100 should have approximately 3.85 V on its emitter (pin 3) and 3.30 V on its base (pin 2).

The second gain stage V110 should be biased with approximately 2.70 V on the collector and 0.73 V on the base. V100 acts as a switch, sourcing current to V110 when the bias voltage on the emitter resistor goes high to approximately 4.7 V. V100 should have approximately 2.70 V on its emitter (pin 6) and 3.30 V on its base (pin 5).

SAW Filter (Z101)

This Surface Acoustic Wave (SAW) filter provides rejection in the RX band (869 to 894 MHz).

3rd Stage Amplifier (V112)

The third gain stage (V112) is a BJT amplifier in the common emitter configuration. This stage provides of gain to the TX chain, providing drive power to the final PA stage, V113.

The third gain stage V112 should be biased with approximately 6.0 V on the collector and 0.7 V on the base. The dual transistor package V108 acts as a switch, sourcing current to V112 when the voltage to the emitter resistors goes high to approximately 6.2 V. V108 should have approximately 6.0 V on its pin 6 emitter and 5.5 V on both bases (pins 2 and 5).

CLY–10 Power Amplifier (V113)

For CDMA operation the CLY–10 bias current is increased directly with increasing output power to ensure linear performance. The bias current is controlled by changing the gate voltage. For minimum bias, the 100 mA case, the bias on the gate will be about –2.35 V. For maximum bias, or the 250 mA case, the bias on the gate will be about –2.00 V. The bias voltage on the drain will be approximately 6.2 V under all biasing conditions.

For AMPS The PA bias current is set for 100mA at AMPS power level 7. The PA bias current increases due to self biasing at power level 2 (approximately 27 dBm output). For AMPS TX operation at power level 2 the gate voltage will be approximately –2.7 V and the drain voltage will be 6.2 V.

PA Bias Circuitry

The transistor network located at the center of the top of the transmitter schematic is the current bias to the four gain stages. V109 is the source of current, drawing energy directly from the battery voltage, VRFT (VRF). The transistors V102 – V104 serve as switches to control the flow of current to the gain stages by shutting V109 on and off. Both the VNEG and TX_PUNC voltages must be active for the current source V109 to be switched on. TX_PUNC is a logic line from the CDSB ASIC (D704), pin 129. It will be approximately 3.15 V when the transmitter is on. The negative VGG supply is a function of VNEG. VNEG will be approximately –4.1 V when the transmitter is switched on.

The transistor pair V105 regulates the collector voltage at V109 to about 6.3 V, The emitter of V109 is biased by VRF, which will be the battery voltage. When the transistor is on, pin 2 of V104 will be approximately 5.3 V. Pins 3 and 6 will remain fixed at approximately 4.7 V.

Detector (V114)

The PA's RF output power is sampled by a capacitively coupled schottky dual diode detector. The dectector produces a DC voltage that is exponentially proportional to the PA's RF output power. The DC output voltage decreases as RF power increases. The typical detector voltage TXI varies from about 2.3 V for minimum RF power to 0.9 V for maximum RF power. In AMPS mode the detector voltage at N202, pin 1 is approximately 1.1 V when the TX is at power level 2. The VTXS supply biases the detector. This DC supply should be approximately 4.40 V in both AMPS and CDMA modes.

Note *it is unwise to probe the detector @ C173 to read the TXI signal. Doing so will load it down, providing inaccurate readings. It is better to prove TXI at the buffer amp N202, pin 1 or 2.*

Isolator (V710)

The Isolator isolates the PA from the Duplexor.

Duplexor (Z102)

The Duplexor isolates the transmit signal from the receiver path and permits the phone to transmit and receive signals simultaneously (i.e. Full Duplex operation). The Duplexor is a three terminal, dual frequency (RX and TX) bandpass splitter/filter and provides the common antenna connection to the TX and RX circuits. The transmit signal enters the Duplexor at the “TX” port and exits from the “ANT” port. The duplexor is the largest device on the PCB and can be found on the TX schematic.

Thermister (R141)

The thermister R141 changes resistance as a function of its temperature. The voltage across this device comprises the RFTEMP1 signal to the MCU.

Receiver Functional Description

Introduction

NHD–4, being a dual mode phone, has essentially two receivers, the analog AMPS and the digital CDMA. These two receivers share a common front end and only become distinct in the IF stage after mixing down to 45 MHz. A diode switch, V10, channels the received signal to the appropriate receiver. It is important to keep in mind that the AMPS and CDMA signals are significantly different. The AMPS signal is a FM modulated carrier with a channel bandwidth of 30 kHz. A CDMA signal is a 1.23 MHz wide spread spectrum carrier pedastal that appears noise–like. This functional description is divided into three major sections, the Front End, the AMPS Receiver and the CDMA Receiver.

Antenna and Coaxial Cable (W400)

The receiver chain begins at the antenna. The antenna is impedance matched to the coax with L400 and C400. The coaxial cable, W400, routes the signal down the length of the phone to the bottom connector. When no external RF connection is made at the bottom connector (X701), the received signal is directed back up to the top of the phone via the second, shorter coax length. When the bottom connector is in place, i.e. with the car kit, the coax leading to the antenna is taken out of the circuit and the received RF signal launches in from the external connection. It then proceeds up the shorter length of coax to the top of the phone and into the duplexor.

Duplexor (Z102)

The Duplexor, Z102 serves to isolate the transmit signal from the receiver path, and vice versa. The received signal proceeds from the coaxial cable W400, through C150 into the Duplexor at the point labeled RFOUT. In the case of the receiver RFOUT is actually the RF input. The duplexor is the largest device on the PCB and can be found on the TX schematic. This signal exits the Duplexor on the opposite side that it entered, at the port labeled RX_IN. It then proceeds through C762 into the RF LNA Switch, N702.

RF LNA Switches (N701, N702) and SWAGC/RX_CAL Control Lines

NHD–4 has a low noise amplifier, or LNA that can be switched in and out of RX chain. The LNA is always on during AMPS RX operation. The switching operation is accomplished by two RF GaAs switches N701 and N702.

For operation with the LNA ”on”, RF is routed into the first switch, N702 at pin 5. It exits at pin 7 and enters the LNA through L22. After amplification the receive signal leaves the LNA through C98 and enters the second RF switch, N701, at pin 7. The signal exits the second switch through pin 5 and proceeds into the UHF RX SAW (Z1) through C771. Switching control is accomplished at pins 8 and 1 for both switches. For operation with the LNA (V12) ”on”, or CDMA Hi–Gain, the RX_CAL line at R783/R6 should be logic ”high” at approximately 2.80 V. The SWAGC line at R830 should be logic level ”low”, approximately 0.00 V. The VCONT2 pins (pin 1) of N701 and N702 should be approximately 3.80 V. The VCONT1 pins (pin 8) should be approximately 0.0 V.

For operation with the LNA ”off”, RF is routed into the first switch, N702 at pin 5. It exits at pin 2 and enters a resistive matching network through C787, consisting of R827, R834, and R828. It leaves this network through C804 and enters the second RF switch, N701, at pin 2. The signal exits the second switch through pin 5 and proceeds into the UHF RX SAW (Z1) through C771. Switching control is accomplished at pins 8 and 1 for both switches. For operation with the LNA ”off”, or CDMA Lo–Gain, the RX_CAL line at R783/R6 should be logic ”low” at approximately 0.00 V. The SWAGC line at R830 should be logic level ”high”, approximately 3.00 V. The VCONT2 pins (pin 1) of N701 and N702 should be approximately 0.00 V. The VCONT1 pins (pin 8) should be approximately 2.90 V.

The following truth table details the states of the switches and the LNA verse the modes of the phone. This table is also found on the RX schematic.

State	RXCAL	LNA	VCONT1	SWAGC	VCONT2
AMPS	1	ON	0	0	1
CDMA Hi–Gain	1	ON	0	0	1
CDMA Lo–Gain	0	OFF	1	1	0
RXCAL	0	OFF	0	0	1

LNA (V12) and RX SAW Filter (N701)

Current to source this device originates from the V11 network. C98 delivers the amplified UHF RX signal to the second RF switch N701, pin 7. The output of N701 (pin 5) routes the signal to the UHF RX SAW Filter (Z1). The UHF signal leaves the SAW at pin 5 and enters the mixer through C41.

Mixer (T1)

The mixer is a three port passive Si device. Of the eight pins, five are grounded. The remaining three constitute the RF, LO and IF ports. The received UHF signal enters the mixer at pin 5, the LO port, from C41. The RX_LO signal originates from the UHF synthesizer and enters the mixer at pin 8, the RF port, via a microstrip line which runs within the PCB, under the components on the board. It is 45 MHz greater in frequency than the received signal. These two incoming signals mix within the device and produce a 45 MHz IF signal which leaves the mixer at the IF port, pin 4.

It should be noted that the RF and LO ports on the mixer, pins 5 and 8 are implemented opposite in this circuit to what the device manufacturer has specified. On the schematic it shows the received RF entering the mixer at the LO port and the RX_LO entering the mixer at the RF port. This is not a design flaw. The device works correctly either way.

1st IF AMP (V9) and the Diode Switch (V10)

After mixing down to the 45 MHz IF frequency the received signal is again amplified by the 1st IF amplifier, V9. The IF signal leaving the mixer moves through the matching network L701, C77, L13, and R24 and enters the base of the transistor V9, pin 3. It exits the collector, pin 1 and immediately enters the diode switch which routes the signal to either the AMPS or CDMA receiver.

Bias current to the base of this gain stage differs from AMPS to CDMA operation. In CDMA mode the VRXM alone supplies base current to V9 through R13 and L11. The voltage at the base, pin 3 should be 1.85 V in CDMA mode. VRXM should be approximately 4.40 V at R13. In AMPS operation the dual BJT package V4 and neighboring resistors R4, R5, R14, and R15 change this bias current when the VRXAM DC voltage supply comes on. Voltage at the base of V4 (pin 2) is about 2.25 V. The voltage on the base of V9 (pin 3) should be approximately 1.0 V in AMPS mode.

Collector biasing of V9 also varies from AMPS to CDMA mode. The VRXAM DC supply (VRXA from the CDCONT IC) comes on in AMPS mode. The collector of V9 should be approximately 3.40 V in AMPS mode.

The collector of V9 should be approximately 3.50 V in CDMA mode. VRXDM should be about 4.50 V at R23, pin 1.

AMPS Receiver

Crystal Filter (Z3)

The 45 MHz AMPS RX IF signal routes through the diode switch and is filtered by Z3, the crystal filter. L15, C83, C84 and R29 provide matching and attenuation into the filter. The filtered signal exiting the crystal proceeds through C14 and into the AMPS RX IC, D1 at pin 16.

AMPS RX IC (D1)

The AMPS RX IC, D1 completes the demodulation of the AMPS signal with the help of some peripheral circuitry. VRXAM supplies approximately 4.40 V to this IC at pin 4. The 45 MHz IF signal enters at pin 16, the Mixer In port. The IC supports the active portion of another oscillator circuit used in the second down conversion, or mixing stage. This 2nd LO runs at 44.545 MHz. L16, C6, C7, C9, R1 and crystal B1 make up the resonator circuit of this oscillator. This resonator connects to the IC at pins 1 and 2.

The 45 MHz 1st IF signal mixes with the 44.545 MHz LO to produce the 2nd IF signal at 455 kHz. This mixing stage is located within the AMPS RX IC. The down converted 2nd IF signal exits the mixer at pin 3 of the IC and is filtered by Z4, the 455 kHz ceramic filter. C5 and C4 help match the input and output of the filter to the IC at pins 5 and 6.

The 455 kHz 2nd IF FM signal is quadrature demodulated by a circuit comprised of L17, C85 and R32, all in parallel across pins 4 and 10. It is important to NOT adjust the tunable inductor L17!!! Doing so will NOT assist in troubleshooting a faulty receiver, it will only make things WORSE!!! This device is tuned by its manufacturer to the proper inductance.

The audio signal remaining exits pin 9 of the IC and proceeds through R2. C1 and C10 provide some filtering before this signal is A/D converted by the CDRFI IC, N700. This audio line is labeled ANARX + DA. This signal may be viewed with an oscilloscope as an audio sine wave of approximately 380 mVpp. The output frequency will depend upon the input frequency deviation of the modulated signal entering the phone.

RSSI Indicator Line

Receive signal strength indication (RSSI) is provided via pin 12 of the AMPS RX IC, D1. As the signal level is increased the voltage at pin 12 or C13 will also increase. This voltage should be approximately 1.78 V for a modulated –75 dBm input signal.

CDMA Receiver

CDMA IF SAW Filter (Z2)

For CDMA RX operation the 45 MHz IF signal exits the 1st IF amplifier (V9) through pin 4 of the diode switch (V10). This signal then enters the CDMA SAW Filter (Z2), passing through an impedance matching network comprised of L8, L9, C71, C72, and C73. R22 and R23 supply current to V9 and V10. R22 also serves to set the Q of L8. The SAW filter itself has a bandwidth of 1.23 MHz. The output at pin 10 is matched to the next stage via C70 and L7. Two of the ten pins of this device serve as the RF input and output, while the other eight are ground. It is extremely important that all ten pins are well soldered to the PCB.

1CDMA IF LNA Stage (V7)

The received CDMA IF signal goes through another stage of amplification before being down converted to baseband by the CDAGCR IC (N1). V7 is this gain stage, a BJT in common base configuration. V8 temperature compensates the base voltage to V7 at the junction of R19, R20 and R21. The IF signal leaves this amplifier through the collector, pin 1. It enters the CDAGCR IC (N1) at pin 8, passing through an impedance matching network L4 and C69. In CDMA RX operation about 0.60 V should be found on the emitter of V7, pins 2 and 4. The collector will have about 1.40 V. The collector and base of V8 will be approximately 0.7 V.

CDAGCR – CDMA Receiver IC (N1)

The CDAGCR IC (N1) serves two functions. It controls the gain (AGC) of the received CDMA signal, and it quadrature demodulates the 45 MHz IF signal, and at the same time brings the IF down to baseband frequencies.

The dynamic gain of the CDAGCR IC (N1) is controlled by the two incoming signals RX_IREF and RX_ICT. These two signals are currents entering the IC at pins 23 and 24, through R17 and R16 respectively. RX_IREF is the reference current. RX_ICT is the control current. It varies in accordance with the gain required of the IC.

To measure these currents directly requires that you break the circuit and input an ammeter. This is impractical. Instead it is suggested that you simply measure the voltage drop across R17 and R16 to determine if these signals are correct. The voltage drop across R17 will remain constant at approximately 360 mV, while the drop across R16 will vary from approximately 10 mV to 115 mV. A simple test to demonstrate the functionality of the CDMA receiver AGC is found in the Troubleshooting portion of this document. This test also provides a table detailing the voltage drops (currents) generated verse received RF signal levels.

The DC supply VRXD provides bias to this IC. This supply will be approximately 4.40 V when the phone is in CDMA mode. When troubleshooting be sure to check all eight pins.

The demodulated baseband digital I and Q signals exit the CDAGCR IC at pins 26 and 27 and proceed to the BFILCT IC (N2) through C33 and C57.

Either of these two signals can be viewed with an oscilloscope. With an RF input of 881.62 MHz CW into a CDMA receiver tuned to channel 384, either of these signals will appear as sine waves of approximately 190 mVpp magnitude, 100 kHz in frequency.

BFILCT (N2)

The BFILCT IC, N2 serves to filter the demodulated baseband I & Q signals before delivering them to the CDRFI IC (N700) for A/D conversion. This IC also amplifies the I & Q signals. The I & Q signals enter this IC at pins 13 and 20 via C33 and C57 respectively. During normal operation pin 3 of N2 will be pulsed about every 10 seconds by the RX_FIL_CAL signal. The VBBFILM DC supply should be approximately 3.10 V at C36, C55 or C56. About 3.00 V should exist at the pin 8, R791, R792 node.

Synthesizer Functional Description

Introduction

The synthesizer module generates the oscillations necessary for the operation of the phone. It provides the clock signal for digital ICs and it creates the UHF and VHF oscillations needed to up convert and down convert the baseband signals to RF frequencies. There are three synthesizers in the NHD–4 phone. Only two will be discussed here, the UHF and 180 MHz VHF. The third, a 9.8304 MHz clock oscillator, is discussed in the CDCONT/AGC Functional Description.

The UHF and 180 MHz VHF oscillations are generated by phase lock loops. The 15.36 MHz VCTCXO (G300) is the reference oscillator for all frequency synthesis.

PLL IC (N300)

The core of the NHD–4 synthesizer is the PLL IC (N300). This IC supports two independent PLL circuits, both of which are used in NHD–4. The primary synthesizer is used to generate the tunable UHF LO. The secondary synthesizer generates a constant 180 MHz VHF signal. The IC is programmed by three lines; RX_LE, DATA, and CLK. There are three DC voltage supply pins on this device. Pins 4 and 5 should be approximately 3.15 V, and Pin 18 should be 4.15 V.

The VCTCXO Clock (G300)

A 15.36 MHz VCTCXO (G300) creates the common reference frequency (clock) for the synthesizers, as well as the remainder of the phone. Biasing this device requires 3.60 V on pin 4, V_{DD}. The 15.36 MHz clock signal is routed to the PLL IC (N300) pin 8, CDRFI IC (N700), and CDCONT IC (N201).

The UHF Synthesizer

The operating frequency range of the UHF synthesizer is 914.01 to 938.97 MHz, or AMPS channels 990 to 799. This synthesizer has two modes of operation, Normal and Fast. Normal mode is the default, while Fast mode allows the synthesizer to lock to frequency faster. Fast mode is activated with the Fast line held active high. The output of the UHF passive loop filter is a DC voltage of 1.0 to 3.0 volts that tunes the VCO (G301) at the “C” pin. The VCO (voltage controlled oscillator) (G301) generates the UHF LO. The “B” pin of the VCO should be biased with approximately 4.25 V, supplied from VRXS via R808. VRXS should be approximately 4.15 V at R808 when the phone is in AMPS mode.

The output RF power from the VCO is routed to two gain stages and back to the PLL IC pin 6 to close the phase locked loop. The two gain stages amplify the UHF LO signal and provide it to the RX and TX modules respectively.

N704 is biased at pin 3 by approximately 3.40 V, supplied from VRX via R803. VRX should be about 4.40 V. The RX_LO signal is routed to the mixer (Z1) through a SAW filter (Z701).

N705 is biased at pin 3 to approximately 2.70 V, from VTXT through R809 and R815. VTXT should be approximately 4.40 V. The TX_LO signal is delivered to the CDAGCT IC (N100) pin 2, through C795.

The VHF Synthesizer

The second PLL frequency synthesizer is the VHF, generating a constant 180 MHz. The varactor diode also doubles as an FM modulator for AMPS TX operation. The 180 MHz output of the oscillator is amplified by the common base buffer amp (V303).

The voltage at junction of R313 and the cathode of the varactor diode (V301) should always be a constant voltage somewhere between 1.5 V and 3.0d V. The base, emitter and collector of the oscillator transistor (V302) should be 2.32 V, 1.73 V, and 2.56 V respectively. The buffer amplifier (V303) is biased up with 4.30 V at the collector, 3.33 V at the base, and 2.62 V at the emitter. All these voltages originate from VRX90 which ought to be about 4.40 V at R806.

The ANATX line feeds the AC audio signal from the CDRFI IC (N700) via C341. When active, this signal can be viewed with an oscilloscope. With the ST tone active, the ANATX line will have an amplitude of approximately 250 mVpp at the R317, C341 node. ST (signaling tone) generates 10 kHz of modulation frequency.

AGC Functional Description

Signal Descriptions

Below are descriptions of the signals found within the CDCONT circuitry.

9.8304 MHz

The 9.8304 MHz line is the output of the synthesizer onboard the CDCONT IC (N201). Measured at C217 this signal should be approximately 700 mV when measured with an oscilloscope and a high impedance scope probe. This signal is used to clock the baseband portions of the phone while operating in CDMA mode.

15.36 MHz

The 15.36 MHz line is the reference frequency input to the synthesizer on board the CDCONT IC (N201). Measured at the CDCONT side of R319 this signal should be approximately 540 mV when measured with an oscilloscope and high impedance scope probe. This signal originates from the VCTCXO (G300).

AGC_REF

This is a PDM voltage used to control the level of attenuation of the AT–109 (V106). This signal originates at the CDSB ASIC (D704), pin 115. Measured at this pin, this PDM will vary from 0 to 3.15 V when moved over its dynamic range. The ASIC side of R701 would be another good probe point. Be aware that at this node the voltage will still be pulsed AC, however a true RMS meter will average out the current to provide the correct DC voltage.

LIM_ADJ

This control signal is the output of the comparator used in the CDMA TX Gain Limiting control feature. It signals the CDSB ASIC (D704) when the maximum allowed CDMA TX output power has been achieved. This signal can be read at C807. When not at the output power limit, this signal will be logic high at approximately 3.15 V. When the limit has been reached this signal will toggle low (0.0 V) and high (3.15 V) at a frequency of approximately 400 Hz.

RFEN 0–2

The three RFE lines determine the mode of the phone. They originate from the CDSB ASIC (D704) at pins 150, 149, and 134 for RFE0, RFE1 and RFE2 respectively.

RX_GAIN

RX_Gain originates at pin 7 of the CDRFI, and is used for CDMA RX Gain control.

RX_ICT

RX_ICT is the control current to the CDAGCR IC (N1).

RX_IREF

RX_IREF is the reference control current to the CDAGCR IC (N1).

RX_OFFSET

RX_OFFSET is a PDM voltage. CDSB ASIC (D704) pin 123, this PDM will vary from 0 to 3.15 V when moved over its dynamic range. The ASIC side of R712 would be another good probe point.

TX_GAIN

TX_Gain originates at pin 5 of the CDRFI, and is used for CDMA TX Gain control.

TX_ICT

TX_ICT is the control current to the CDAGCT IC (N100).

TX_IREF

TX_IREF is the reference control current to the CDAGCT IC (N100).

TX_OFFEST

TX_OFFSET is a PDM voltage. Measured at the CDSB ASIC (D704) pin 120, this PDM will vary from 0 to 3.15 V when moved over its dynamic range. The ASIC side of R711 would be another good probe point.

TXB

TXB is a PDM voltage. When measured at its origin, pin 122 of the ASIC, this PDM will vary from 0 to 3.15 V when moved over its dynamic range. The ASIC side of R703 would be another good probe point.

TXI

The TXI signal is a voltage originating from the Detector (V114). TXI will be approximately 1.0 V when the phone is transmitting at maximum power. Note: It is important to never read TXI at the detector, pin 1. Doing so will load this device down. TXI should be read from N202, pin 1 or 2.

TXI_REF

TXI_REF is a PDM voltage. When measured at its origin, pin 126 of the ASIC, this PDM will vary from 0 to 3.15 V when moved over its dynamic range. The ASIC side of R702 would be another good probe point.

VBAT

VBAT is the battery voltage.

VC

VC is the control voltage to the AT–109 variable attenuator. VC will typically be about 3.8 V when signaling the AT–109 for minimum attenuation, as it does in AMPS mode operation.

VCO_EN

VCO_EN is better known as the Reset line. It originates at the CDSB ASIC (D704) pin 128. It terminates at the CDCONT IC (N201) pin 23, the Reset pin.

DC Voltage Supplies

The CDCONT IC (N201) contains the DC voltage regulators, or supplies, used to provide DC bias throughout the RF modules of the phone. There are nine regulators. Voltage regulation is performed within the CDCONT IC for six of these; VRX90, VRX, VRXS, VTXS, VRXD and VRXA. The remaining three, VTX, VBBFIL, and VRXD_R have some additional regulation external to the CDCONT. VBAT, the battery voltage, is the voltage source. These voltage supplies are turned on and off depending upon the mode of the phone. The table below details the active supplies and their approximate voltages for operation in both the AMPS RX/TX mode and the CDMA RX/TX mode. A shaded box indicates that supply is on for the respective mode. Test points for voltage measurement of the respective supplies are also listed.

Mode	VBBFIL	VNEG	VRX	VRXA	VRXD	VRXD_R	VRXS	VRX90	VTX	VTXS
Measurement point	C224	N200 pin 5	C206	C219	C218	N706 pin 4	C207	C205	C212	C200
AMPS RX/TX	~ 0.0	–4.10	4.45	4.45	1.65	~ 0.0	4.45	4.45	5.30	4.45
CDMA RX/TX	3.15	–4.10	4.45	1.20	4.45	4.50	4.45	4.45	5.35	4.45

* Values are in volts (V)

VBBFIL

VBBFIL provides bias to the BFILCT2 IC (N2). The VBBFIL voltage supply circuit uses an external PNP transistor (V203) for regulation. This supply is on during CDMA RX/TX operation. When VBBFIL is active the collector of V203 will be approximately 3.15 V, the emitter voltage will be VBAT, the battery voltage, and the base voltage will be approximately 0.7 V less than the emitter voltage.

VNEG

VNEG is created by the negative voltage generator N200. The VTXS supply is used as the positive voltage bias from which to generated the negative voltage. Whenever VTXS is active, VNEG will be present. VNEG is approximately

– 4.1 V when VTXS is 4.45 V.

VRX

VRX is used to supply the LNA (V12) and the LNA switches (N701, N702). It is also biases the RX_LO gain stage (N704) at the UHF synthesizer module. VRX will be approximately 4.45 V while active in AMPS RX/TX mode.

VRXA

VRXA is used for AMPS RX applications such as bias for the AMPS RX IC (D1) and the 1st IF gain stage while in AMPS operation. VRXA will be approximately 4.45 V when active.

VRXD

VRXD will be approximately 4.45 V while active.

VRXD_R

Both the CDAGCR IC (N1) and the CDMA IF LNA (V7) are biased from this supply. The 1st IF gain stage (V9) is also biased from this supply.

N706 is a voltage regulator IC providing 4.50 V at pin 4 when enabled at pin 1.

VRXS

VRXS is used to bias the PLL IC (N300) and the 15.36 MHz VCTCXO (G300). VRXS should be approximately 4.45 V when active in the AMPS RX/TX mode.

VRX90

VRX90 is used to bias the 180 MHz VCO and buffer amp. VRX90 should be approximately 4.45 V when active in the AMPS RX/TX mode.

VTX

VTX is used in transmitter applications, mainly for biasing the CDAGCT IC (N100).

Just like the VBBFIL, the VTX supply circuit uses an external PNP transistor (V202) for regulation. The resistors R201 and R202 are used as part of this external regulator circuit. This supply is on whenever the transmitter is on. When this supply is active, the collector of V203 will be approximately 5.30 V, the emitter will be VBAT, the battery voltage, and the base of V203 will be approximately 0.7 V down from the emitter.

VTXS

VTXS is used in transmitter applications such as bias for the AT–109 variable attenuator (V106) and bias to the Detector (V114). This supply also biases the negative voltage generator (N200) which creates VNEG. VTXS will be approximately 4.45 V when active in the AMPS RX/TX mode.

9.8304 MHz Synthesizer

The CDCONT IC (N201) contains a PLL frequency synthesizer which generates a 9.8304 MHz oscillation used to clock the baseband modules of the phone. The 15.36 MHz VCTCXO is used as the reference oscillation. VRXD_C (VRXD) supply biases the PLL at pin 29 of N201 via R212, decoupled with C221 and C222. There should be approximately 4.15 V on Pin 29. The loop filter of the PLL is external to the CDCONT IC, comprised of R213, R214, C209, C210, and C211. The internal VCO input, pin 38 should have approximately 1.60 V on it.

In CDMA operation the bias current to the final PA stage (V113) is dynamic. Bias current is set such that the CLY–10 (V113) final PA stage will draw 100 mA for up to 10 dBm of CDMA TX output power. Above 10 dBm of output the bias changes, ramping up to a maximum draw of 250 mA achieved at 23 dBm of output power. The slope of this ramp is defined as the TXB Slope. The 250 mA current bias is maintained for power output greater than 23 dBm. This feature is referred to as Dynamic TXB. The following graph depicts the dynamic relationship between CDMA output power and CLY–10 (V113) bias current.

Parts List GR1_17A

p.n 0200519 EDMS issue 23.0

Item	Code	Description	Value	Type
R001	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R002	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R003	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R004	1430740	Chip resistor	330	5 % 0.063 W 0402
R005	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R006	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R013	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R014	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R015	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R016	1430740	Chip resistor	330	5 % 0.063 W 0402
R017	1430740	Chip resistor	330	5 % 0.063 W 0402
R018	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R019	1430700	Chip resistor	10	5 % 0.063 W 0402
R020	1430744	Chip resistor	470	5 % 0.063 W 0402
R021	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R022	1430748	Chip resistor	680	5 % 0.063 W 0402
R023	1430700	Chip resistor	10	5 % 0.063 W 0402
R024	1430726	Chip resistor	100	5 % 0.063 W 0402
R025	1430693	Chip resistor	5.6	5 % 0.063 W 0402
R028	1430724	Chip resistor	82	5 % 0.063 W 0402
R029	1430734	Chip resistor	220	5 % 0.063 W 0402
R030	1430748	Chip resistor	680	5 % 0.063 W 0402
R031	1430700	Chip resistor	10	5 % 0.063 W 0402
R032	1430766	Chip resistor	3.9 k	5 % 0.063 W 0402
R033	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R034	1430710	Chip resistor	22	5 % 0.063 W 0402
R035	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R036	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R100	1430744	Chip resistor	470	5 % 0.063 W 0402
R101	1430700	Chip resistor	10	5 % 0.063 W 0402
R102	1430744	Chip resistor	470	5 % 0.063 W 0402
R103	1430708	Chip resistor	18	5 % 0.063 W 0402
R104	1430726	Chip resistor	100	5 % 0.063 W 0402
R105	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R106	1430734	Chip resistor	220	5 % 0.063 W 0402
R107	1430766	Chip resistor	3.9 k	5 % 0.063 W 0402
R108	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R109	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402

R110	1430720	Chip resistor	56	5 % 0.063 W 0402
R111	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R112	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R113	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R114	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R115	1430726	Chip resistor	100	5 % 0.063 W 0402
R116	1430726	Chip resistor	100	5 % 0.063 W 0402
R117	1430693	Chip resistor	5.6	5 % 0.063 W 0402
R118	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R119	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R120	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R121	1430718	Chip resistor	47	5 % 0.063 W 0402
R124	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R125	1430732	Chip resistor	180	5 % 0.063 W 0402
R126	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R127	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R128	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R129	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R130	1430700	Chip resistor	10	5 % 0.063 W 0402
R132	1430732	Chip resistor	180	5 % 0.063 W 0402
R133	1430732	Chip resistor	180	5 % 0.063 W 0402
R134	1430714	Chip resistor	33	5 % 0.063 W 0402
R135	1430746	Chip resistor	560	5 % 0.063 W 0402
R136	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R137	1430734	Chip resistor	220	5 % 0.063 W 0402
R138	1430691	Chip resistor	2.2	5 % 0.063 W 0402
R139	1430700	Chip resistor	10	5 % 0.063 W 0402
R140	1430802	Chip resistor	82 k	5 % 0.063 W 0402
R141	1800659	NTC resistor	47 k	10 % 0.12 W 0805
R143	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R201	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R202	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R203	1430794	Chip resistor	39 k	5 % 0.063 W 0402
R204	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R205	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R206	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R207	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R208	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R209	1430726	Chip resistor	100	5 % 0.063 W 0402
R210	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R211	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R212	1430700	Chip resistor	10	5 % 0.063 W 0402
R213	1430784	Chip resistor	15 k	5 % 0.063 W 0402

R214	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R215	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R216	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R217	1430772	Chip resistor	5.6 k	5 % 0.063 W 0402
R218	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R219	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R220	1430700	Chip resistor	10	5 % 0.063 W 0402
R222	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R223	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R224	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R225	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R226	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R228	1430776	Chip resistor	8.2 k	5 % 0.063 W 0402
R229	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R300	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R301	1430808	Chip resistor	150 k	5 % 0.063 W 0402
R302	1430798	Chip resistor	56 k	5 % 0.063 W 0402
R307	1430710	Chip resistor	22	5 % 0.063 W 0402
R308	1430718	Chip resistor	47	5 % 0.063 W 0402
R309	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R310	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R311	1430802	Chip resistor	82 k	5 % 0.063 W 0402
R312	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R313	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R314	1430756	Chip resistor	1.2 k	5 % 0.063 W 0402
R315	1430760	Chip resistor	1.8 k	5 % 0.063 W 0402
R316	1430740	Chip resistor	330	5 % 0.063 W 0402
R317	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R318	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R319	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R321	1430786	Chip resistor	18 k	5 % 0.063 W 0402
R322	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R323	1430700	Chip resistor	10	5 % 0.063 W 0402
R324	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R325	1430748	Chip resistor	680	5 % 0.063 W 0402
R326	1800659	NTC resistor	47 k	10 % 0.12 W 0805
R327	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R328	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R329	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R331	1430730	Chip resistor	150	5 % 0.063 W 0402
R400	1430724	Chip resistor	82	5 % 0.063 W 0402
R401	1430716	Chip resistor	39	5 % 0.063 W 0402
R500	1430842	Chip resistor	680 k	1 % 0.063 W 0402

R501	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R502	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R503	1430840	Chip resistor	220 k	1 % 0.063 W 0402
R504	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R505	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R506	1430801	Chip resistor	2.1 k	1 % 0.063 W 0402
R507	1430844	Chip resistor	3.9 k	1 % 0.063 W 0402
R508	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R510	1430730	Chip resistor	150	5 % 0.063 W 0402
R511	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R512	1430762	Chip resistor	2.2 k	5 % 0.063 W 0402
R513	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R514	1430764	Chip resistor	3.3 k	5 % 0.063 W 0402
R515	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R516	1430726	Chip resistor	100	5 % 0.063 W 0402
R600	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R601	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R602	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R603	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R604	1430726	Chip resistor	100	5 % 0.063 W 0402
R605	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R606	1430780	Chip resistor	12 k	5 % 0.063 W 0402
R607	1430758	Chip resistor	1.5 k	5 % 0.063 W 0402
R700	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R701	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R702	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R703	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R704	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R707	1430726	Chip resistor	100	5 % 0.063 W 0402
R708	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R709	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R711	1430792	Chip resistor	33 k	5 % 0.063 W 0402
R712	1430794	Chip resistor	39 k	5 % 0.063 W 0402
R716	1430726	Chip resistor	100	5 % 0.063 W 0402
R717	1430726	Chip resistor	100	5 % 0.063 W 0402
R718	1430726	Chip resistor	100	5 % 0.063 W 0402
R723	1430726	Chip resistor	100	5 % 0.063 W 0402
R724	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R725	1430726	Chip resistor	100	5 % 0.063 W 0402
R726	1430840	Chip resistor	220 k	1 % 0.063 W 0402
R727	1430840	Chip resistor	220 k	1 % 0.063 W 0402
R728	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R729	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402

R730	1430726	Chip resistor	100	5 % 0.063 W 0402
R731	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R732	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R733	1430726	Chip resistor	100	5 % 0.063 W 0402
R734	1430726	Chip resistor	100	5 % 0.063 W 0402
R735	1430726	Chip resistor	100	5 % 0.063 W 0402
R736	1430726	Chip resistor	100	5 % 0.063 W 0402
R737	1430726	Chip resistor	100	5 % 0.063 W 0402
R738	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R739	1430726	Chip resistor	100	5 % 0.063 W 0402
R740	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R741	1430700	Chip resistor	10	5 % 0.063 W 0402
R751	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R754	1430726	Chip resistor	100	5 % 0.063 W 0402
R755	1430832	Chip resistor	2.7 k	5 % 0.063 W 0402
R757	1430135	Chip resistor	10 M	5 % 0.063 W 0603
R758	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R759	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R760	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R761	1430145	Chip resistor	100 k	1 % 0.063 W 0402
R762	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R763	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R764	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R765	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R775	1430718	Chip resistor	47	5 % 0.063 W 0402
R777	1430718	Chip resistor	47	5 % 0.063 W 0402
R779	1430718	Chip resistor	47	5 % 0.063 W 0402
R781	1430718	Chip resistor	47	5 % 0.063 W 0402
R782	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R783	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R785	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R786	1430726	Chip resistor	100	5 % 0.063 W 0402
R790	1430790	Chip resistor	27 k	5 % 0.063 W 0402
R791	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R792	1430788	Chip resistor	22 k	5 % 0.063 W 0402
R798	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R799	1430730	Chip resistor	150	5 % 0.063 W 0402
R800	1430730	Chip resistor	150	5 % 0.063 W 0402
R801	1430728	Chip resistor	120	5 % 0.063 W 0402
R803	1430726	Chip resistor	100	5 % 0.063 W 0402
R804	1430724	Chip resistor	82	5 % 0.063 W 0402
R805	1430718	Chip resistor	47	5 % 0.063 W 0402
R806	1430710	Chip resistor	22	5 % 0.063 W 0402

R807	1430710	Chip resistor	22	5 % 0.063 W 0402
R808	1430710	Chip resistor	22	5 % 0.063 W 0402
R809	1430734	Chip resistor	220	5 % 0.063 W 0402
R810	1430710	Chip resistor	22	5 % 0.063 W 0402
R813	1430693	Chip resistor	5.6	5 % 0.063 W 0402
R814	1430693	Chip resistor	5.6	5 % 0.063 W 0402
R815	1430734	Chip resistor	220	5 % 0.063 W 0402
R816	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R817	1430774	Chip resistor	6.8 k	5 % 0.063 W 0402
R818	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R819	1430690	Chip jumper		0402
R822	1430690	Chip jumper		0402
R825	1430718	Chip resistor	47	5 % 0.063 W 0402
R826	1430718	Chip resistor	47	5 % 0.063 W 0402
R827	1430744	Chip resistor	470	5 % 0.063 W 0402
R828	1430744	Chip resistor	470	5 % 0.063 W 0402
R830	1430796	Chip resistor	47 k	5 % 0.063 W 0402
R831	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R832	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R833	1430700	Chip resistor	10	5 % 0.063 W 0402
R834	1430700	Chip resistor	10	5 % 0.063 W 0402
R835	1430770	Chip resistor	4.7 k	5 % 0.063 W 0402
R837	1430690	Chip jumper		0402
R838	1430804	Chip resistor	100 k	5 % 0.063 W 0402
R839	1430778	Chip resistor	10 k	5 % 0.063 W 0402
R840	1430754	Chip resistor	1.0 k	5 % 0.063 W 0402
R841	1430788	Chip resistor	22 k	5 % 0.063 W 0402
C001	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C002	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C003	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C004	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C005	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C006	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C007	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C008	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C009	2320554	Ceramic cap.	56 p	5 % 50 V 0402
C010	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C011	2320556	Ceramic cap.	68 p	5 % 50 V 0402
C012	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C013	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C014	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C015	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C017	2320552	Ceramic cap.	47 p	5 % 50 V 0402

C020	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C021	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C022	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C023	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C024	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C025	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C026	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C027	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C028	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C029	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C030	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C031	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C032	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C033	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C034	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C035	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C036	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C037	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C041	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C042	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C043	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C044	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C045	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C046	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C047	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C048	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C049	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C050	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C051	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C052	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C053	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C054	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C055	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C056	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C057	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C058	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C059	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C060	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C061	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C062	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C063	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C064	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C065	2320544	Ceramic cap.	22 p	5 % 50 V 0402

C066	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C067	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C068	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C069	2320558	Ceramic cap.	82 p	5 % 50 V 0402
C070	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C071	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C072	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C073	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C075	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C076	2320562	Ceramic cap.	120 p	5 % 50 V 0402
C077	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C078	2320572	Ceramic cap.	330 p	5 % 50 V 0402
C080	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C081	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C082	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C083	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C084	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C085	2320572	Ceramic cap.	330 p	5 % 50 V 0402
C088	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C089	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C090	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C091	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C092	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C093	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C094	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C095	2320779	Ceramic cap.	100 n	10 % 16 V 0603
C096	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C098	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C100	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C101	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C102	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C103	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C104	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C105	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C106	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C107	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C108	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C109	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C110	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C111	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C112	2320522	Ceramic cap.	2.7 p	0.25 % 50 V 0402
C113	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C114	2320544	Ceramic cap.	22 p	5 % 50 V 0402

C115	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C116	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C118	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C119	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C120	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C121	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C122	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C123	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C124	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C125	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C126	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C127	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C128	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C129	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C130	2312401	Ceramic cap.	1.0 u	10 % 10 V 0805
C131	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C132	2320522	Ceramic cap.	2.7 p	0.25 % 50 V 0402
C133	2611668	Tantalum cap.	4.7 u	20 % 10 V 3.2x1.6x1.6
C134	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C135	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C136	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C137	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C138	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C139	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C140	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C141	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C142	2610027	Tantalum cap.	3.3 u	10 % 16 V 3.2x1.6x1.6
C143	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C144	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C145	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C146	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C147	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C148	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C149	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C150	2320550	Ceramic cap.	39 p	5 % 50 V 0402
C151	2320526	Ceramic cap.	3.9 p	0.25 % 50 V 0402
C152	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C153	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C154	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C155	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C156	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C157	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C158	2320544	Ceramic cap.	22 p	5 % 50 V 0402

C159	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C160	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C161	2320532	Ceramic cap.	6.8 p	0.25 % 50 V 0402
C162	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C163	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C164	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C165	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C166	2320602	Ceramic cap.	4.7 p	0.25 % 50 V 0402
C167	2320534	Ceramic cap.	8.2 p	0.25 % 50 V 0402
C169	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C170	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C171	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C172	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C173	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C174	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C175	2320602	Ceramic cap.	4.7 p	0.25 % 50 V 0402
C176	2320522	Ceramic cap.	2.7 p	0.25 % 50 V 0402
C177	2320550	Ceramic cap.	39 p	5 % 50 V 0402
C200	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C201	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C202	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C203	2611668	Tantalum cap.	4.7 u	20 % 10 V 3.2x1.6x1.6
C204	2611668	Tantalum cap.	4.7 u	20 % 10 V 3.2x1.6x1.6
C205	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C206	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C207	2312410	Ceramic cap.	1.0 u	10 % 16 V 1206
C208	2320546	Ceramic cap.	27 p	5 % 50 V 0402
C209	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C210	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C211	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C212	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C213	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C214	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C215	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C216	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C217	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C218	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C219	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C220	2312410	Ceramic cap.	1.0 u	10 % 16 V 1206
C221	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C222	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C223	2310784	Ceramic cap.	100 n	10 % 25 V 0805
C224	2310784	Ceramic cap.	100 n	10 % 25 V 0805

C225	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C226	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C227	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C300	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C301	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C302	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C303	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C308	2312410	Ceramic cap.	1.0 u	10 % 16 V 1206
C309	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C310	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C311	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C312	2320558	Ceramic cap.	82 p	5 % 50 V 0402
C313	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C314	2310003	Ceramic cap.	470 n	10 % 16 V 0805
C315	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C316	2320524	Ceramic cap.	3.3 p	0.25 % 50 V 0402
C317	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C318	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C319	2320548	Ceramic cap.	33 p	5 % 50 V 0402
C320	2320536	Ceramic cap.	10 p	5 % 50 V 0402
C321	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C322	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C328	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C329	2320550	Ceramic cap.	39 p	5 % 50 V 0402
C330	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C331	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C332	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C333	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C334	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C335	2310780	Ceramic cap.	68 n	10 % 25 V 0805
C336	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C337	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C338	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C339	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C340	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C341	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C400	2320508	Ceramic cap.	1.0 p	0.25 % 50 V 0402
C500	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C501	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C502	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C503	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C504	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C505	2320778	Ceramic cap.	10 n	10 % 16 V 0402

C506	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C507	2340014	Ceramic cap.	47 n	10 % 25 V 0805
C508	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C509	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C510	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C511	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C512	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C513	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C514	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C515	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C516	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C517	2604209	Tantalum cap.	1.0 u	20 % 16 V 3.2x1.6x1.6
C518	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C519	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C520	2610003	Tantalum cap.	10 u	20 % 10 V 3.2x1.6x1.6
C600	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C601	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C602	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C603	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C604	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C605	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C606	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C607	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C608	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C609	2310791	Ceramic cap.	33 n	20 % 50 V 0805
C610	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C611	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C612	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C613	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C700	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C701	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C702	2310003	Ceramic cap.	470 n	10 % 16 V 0805
C703	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C704	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C705	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C706	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C707	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C708	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C709	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C710	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C711	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C712	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C713	2307816	Ceramic cap.	47 n	20 % 25 V 0805

C714	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C715	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C716	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C717	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C718	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C719	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C720	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C721	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C722	2320544	Ceramic cap.	22 p	5 % 50 V 0402
C723	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C724	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C725	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C726	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C727	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C728	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C729	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C730	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C731	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C733	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C735	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C736	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C737	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C738	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C739	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C740	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C741	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C742	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C743	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C744	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C745	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C746	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C747	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C748	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C749	2320560	Ceramic cap.	100 p	5 % 50 V 0402
C750	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C751	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C752	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C754	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C756	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C762	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C765	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C768	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C769	2320552	Ceramic cap.	47 p	5 % 50 V 0402

C771	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C776	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C777	2610200	Tantalum cap.	2.2 u	20 % 2.0x1.3x1.2
C778	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C781	2610100	Tantalum cap.	1 u	20 % 10 V 2.0x1.3x1.2
C782	2320618	Ceramic cap.	4.7 n	5 % 25 V 0402
C784	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C785	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C786	2320744	Ceramic cap.	1.0 n	10 % 50 V 0402
C787	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C788	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C789	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C790	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C791	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C792	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C793	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C794	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C795	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C796	2320518	Ceramic cap.	1.8 p	0.25 % 50 V 0402
C797	2307816	Ceramic cap.	47 n	20 % 25 V 0805
C798	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C800	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C801	2610027	Tantalum cap.	3.3 u	10 % 16 V 3.2x1.6x1.6
C802	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C803	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C804	2320552	Ceramic cap.	47 p	5 % 50 V 0402
C805	2312293	Ceramic cap.		Y5 V 1206
C806	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C807	2320778	Ceramic cap.	10 n	10 % 16 V 0402
C808	2320508	Ceramic cap.	1.0 p	0.25 % 50 V 0402
L004	3643053	Chip coil	120 n	2 % Q=25/25 MHz 1008
L005	3641558	Chip coil	8 n	10 % Q=50 0805
L006	3641300	Chip coil	330 n	5 % Q=30/25 MHz 1008
L007	3641407	Chip coil	910 n	2 % Q=33/25 MHz 1008
L008	3641405	Chip coil	220 n	2 % Q=28/25 MHz 1008
L009	3641340	Chip coil	820 n	2 % Q=33/25 MHz 1008
L011	3641306	Chip coil		5 % Q=33/25 MHz 1008
L012	3640007	Chip coil	150 n	2 % Q=25/25 MHz 1008
L013	3641558	Chip coil	8 n	10 % Q=50 0805
L014	3641574	Chip coil	68 n	5 % Q=40/200 MHz 0805
L015	3643057	Chip coil		5 % Q=22/25 MHz 1008
L016	3641302	Chip coil	470 n	5 % Q=30/25 MHz 1008
L017	3660102	Coil adj.	320 u	2 % Q=80 5X5

L020	3641521	Chip coil	6 n	5 % Q=50/250 MHz 0805
L021	3641574	Chip coil	68 n	5 % Q=40/200 MHz 0805
L022	3641521	Chip coil	6 n	5 % Q=50/250 MHz 0805
L100	3640043	Chip coil	4 n	10 % Q=50/1GHZ 0805
L101	3640051	Chip coil	12 n	5 % Q=45/250 MHz 0805
L102	3641572	Chip coil	22 n	5 % Q=45/250 MHz 0805
L103	3641572	Chip coil	22 n	5 % Q=45/250 MHz 0805
L104	3640051	Chip coil	12 n	5 % Q=45/250 MHz 0805
L105	3641572	Chip coil	22 n	5 % Q=45/250 MHz 0805
L106	3641572	Chip coil	22 n	5 % Q=45/250 MHz 0805
L107	3641522	Chip coil	6 n	20 % Q=50/250 MHz 0805
L108	3640045	Chip coil	10 n	5 % Q=55/750 MHz 0805
L109	3640061	Ferrite bead 0r04 26r/100mhz		
L301	3643051	Chip coil	39 n	5 % Q=55/500 MHz 0805
L302	3641558	Chip coil	8 n	10 % Q=50 0805
L303	3641572	Chip coil	22 n	5 % Q=45/250 MHz 0805
L305	3641308	Chip coil		5 % Q=20/7.9 MHz 1008
L400	3641522	Chip coil	6 n	20 % Q=50/250 MHz 0805
L500	3641262	Ferrite bead 30r/100mhz 2a		
L700	3641262	Ferrite bead 30r/100mhz 2a		
L701	3641574	Chip coil	68 n	5 % Q=40/200 MHz 0805
B001	4510016	Crystal	44.545M	
B700	4510003	Crystal	32.768k	+–20PPM
G300	4510143	VCTCXO	15.36M	+–1.5PPM 3V
G301	4350081	Vco 914–939mhz 4.5v 8ma		
Z001	4510121	Saw filter	881.5+–12.5M	
Z002	4511019	Saw filter	45.0+–0.615M	
Z003	4510129	XTAL filter	45M +–15KHZ	
Z004	4556910	Cer.filt 455+–15khz		
Z100	4510123	Saw filter	836.5+–12.5M	
Z101	4510123	Saw filter	836.5+–12.5M	
Z102	4512012	Dupl 824–849/869–894mhz		
Z701	4510125	Saw filter	934.5+–20.5M	
T001	4340157	Emd40–900l 2bal mixer 900mhz		
V001	4219904	Transistor x 2	UMX1	npn 40 V SOT363
V004	4219904	Transistor x 2	UMX1	npn 40 V SOT363
V007	4210090	Transistor BFG540/X		npn 15 V 129 mA SOT143
V008	4210090	Transistor BFG540/X		npn 15 V 129 mA SOT143
V009	4210090	Transistor BFG540/X		npn 15 V 129 mA SOT143
V010	4112461	Pindix3 bar60 100v 140ma		
V011	4219908	Transistor x 2 UMT1		pnp 40 V SOT363
V012	4210165	Transistor NE68518		npn 6V V 30 mA SOT343
V100	4219908	Transistor x 2 UMT1		pnp 40 V SOT363

V101	4210100	Transistor	BC848W	npn 30 V SOT323
V102	4210052	Transistor	DTC114EE	npn RB V EM3
V103	4210052	Transistor	DTC114EE	npn RB V EM3
V104	4210100	Transistor	BC848W	npn 30 V SOT323
V105	4219904	Transistor x 2	UMX1	npn 40 V SOT363
V106	4340319	At109 var attn 0.5–2ghz 35db so8s		SO8S
V107	4210100	Transistor	BC848W	npn 30 V SOT323
V108	4219908	Transistor x 2	UMT1	pnp 40 V SOT363
V109	4210075	Transistor		SOT223
V110	4210251	Transistor	BFP196	npn 12 V SOT143
V111	4210010	Transistor	BFP183	npn 12 V 65 mA SOT143
V112	4210251	Transistor	BFP196	npn 12 V SOT143
V113	4210342	MosFet GaAs	CLY10	SOT223
V114	4115802	Sch. diode x 2	4V	30 mA SOT23
V115	4210100	Transistor	BC848W	npn 30 V SOT323
V200	4210100	Transistor	BC848W	npn 30 V SOT323
V201	4210102	Transistor	BC858W	pnp 30V 100mA
V202	4200877	Transistor	BCX51–16 pnp 45V 1.5A	
V203	4210054	Transistor	FMMT589 pnp 30V 1A	
V301	4110026	Cap. diode	1SV229	2/10V
V302	4210066	Transistor	BFR93AW npn 12 V 35 mA	
V303	4210066	Transistor	BFR93AW npn 12 V 35 mA	
V304	4210052	Transistor	DTC114EE npn RB V EM3	
V500	4200877	Transistor	BCX51–16 pnp 45V 1.5A	
V501	4200877	Transistor	BCX51–16 pnp 45V 1.5A	
V502	4200877	Transistor	BCX51–16 pnp 45V 1.5A	
V503	4110074	Schottky diode	STPS340U 40V 3A	
V504	4210075	Transistor		
V505	4200226	Darl. transistor	BCV27	npn 30V 300mA
V506	4200226	Darl. transistor	BCV27	npn 30V 300mA
V507	4210102	Transistor	BC858W	pnp 30V 100mA 200MW
V508	4113828	Trans. supr.	SMBJ28A DO214AA	
V509	4116536	Zener diode	BZX84	5 % 2.4 V 0.3 W SOT23
V510	4111824	Diode	BAS16	75 V 250 mA 6 ns SOT23
V701	4210050	Transistor	DTA114EE	pnp RBV EM3
V702	4210052	Transistor	DTC114EE	npn RBV EM3
V703	4210100	Transistor	BC848W	npn 30V SOT323
V704	4110078	Schdix2 bas70–05w 70v 70ma		
V705	4110078	Schdix2 bas70–05w 70v 70ma		
V706	4210050	Transistor	DTA114EE	pnp RBV EM3
V707	4219904	Transistor x 2	UMX1	npn 40V
V708	4219904	Transistor x 2	UMX1	npn 40V
V710	4510119	Isolator 836.5+–12.5mhz 13DB		

V713	4210052	Transistor DTC114EE	npn RB V EM3
V714	4210052	Transistor DTC114EE	npn RB V EM3
V715	4210052	Transistor DTC114EE	npn RB V EM3
V716	4210100	Transistor BC848W	npn 30 V SOT323
V717	4219904	Transistor x 2 UMX1	npn 40 V SOT363
V718	4210052	Transistor DTC114EE	npn RB V EM3
D001	4349694	IC, if amp+fm detector TA31136	SSO16
D500	4340164	IC, regulator TK11247	4.75 V 180 mA SSO6
D700	4340323	IC, SRAM	TSO28
D703	4340151	IC, EEPROM	TSOP28
D704	4370195	Nrdbtf cdma cdsb iv.5	TQFP176
D705	4370153	IC, tms320lc541–50 ci5DSP	PQFP100
D706	4370083	IC, MCU	QFP80A
D707	4340007	IC, SRAM	TSO44
D709	4340219	IC, flash1024x8 90ns tso	E28F008BVB TSO40
D710	4340187	IC, 1xor 2input 1vTC7SL32FU	SOT353
D712	4340183	IC, 1xand 2input 1v TC7SL08FU	SOT353
N001	4370187	Cdagcr3 cdma rx agc rf ic tqfp32	TQFP32
N002	4370291	Bfilct2 baseband filter	SSOP–20
N100	4370191	Cdagct4 cdma tx agc rf ic	TQFP32
N200	4349576	IC, v.conv+1.5–12vto neg ICL7660	SO8
N201	4370197	Wf50c asic cdcont5 rev–c	TQFP64
N202	4340041	IC, 2 x op.amp. TC75W51FU	SSO8
N300	4340005	IC, 2xsynth 1.2ghz 3v UMA1018M	SSO20
N500	4370055	IC, PSL+ power supply	SO24
N600	4340013	St5090 audio codec	
N700	4370189	Cdma rf frnt–end cdrfi 6.0	
N701	4340169	IC, l–band spdt mmic 3v	PG132G
N702	4340169	IC, l–band spdt mmic 3v	PG132G
N704	4340233	Mrfic0916 rf amp 2500mhz	
N705	4340233	Mrfic0916 rf amp 2500mhz	
N706	4340139	IC, regulator TK11245AM 0.22A	
X400	9510277	Antenna clip 4D25006	
X700	5431718	Flexfoil connect	
X701	5469792	Syst.conn.4DC+JACK+16AF+1RF	
W400	9780168	Semi–rigid coax cable dmd00192	
	9854105	PCB GR1	

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